

ACS 2023 Surgeons and Engineers: A Dialogue on Surgical Simulation Meeting

Challenges in Surgical Education

Leveraging Eye-Gaze Data to Augment Surgical Faculty-Resident Postoperative Case Video

Analysis

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Background: Learning how to do minimally invasive surgeries is a cognitively demanding task that requires a high degree of visuo-spatial coordination between attending (trainer) and resident (trainee) surgeons. There is a well-documented body of literature that shows the ability of eye-tracking to produce robust quantitative data and serve as an objective measurement method, with possible applications in surgical training and skill assessment.

Current Challenges: Evidence-based guidance for trainee skills assessment and high-quality feedback based on operative case video analysis is surprisingly limited, given the foundational role of this activity in surgical education. Importantly, it remains an open question how instructors can best leverage operative case video analysis, including artificial intelligence approaches, to help trainees develop professional vision and reflect on their own performance.

Need of Innovation: In this study we aim to develop a multimodal dashboard that enables attending surgeons to easily provide verbal feedback to residents. Additionally, we will combine video feed, conversation transcript, and eye-gaze data to help surgeons easily navigate a surgery recording and provide analytics to help residents reflect on their performance. The PI team has done substantial prior work including a series of operating room observations with eye tracking data collection, and an interview study understanding both surgeons' needs and challenges with intra- and post-operative coordination, teaching and learning. The research study so far includes cholecystectomy surgeries with further extension to extra-peritoneal inguinal hernia and appendicitis surgeries. Our long-term goal is to develop human-AI collaborative techniques that enable expert surgeons to create scalable training modules and enable resident surgeons to monitor their own progress from novice to expert. This concept (offering trainee-specific, data-driven assessment and feedback) has a strong path forward to not only impact the way laparoscopic resident training is carried out across institutions, but also be translated to develop data-informed training programs for other surgical procedures and approaches as well as other domains such as operating room resuscitation, emergency medical services (EMS), and ICU-based emergencies.